29

A Re-examination of *Psilichthys selwyni* Hall, from the Lower Cretaceous of Victoria

By M. Waldman*

Abstract: *Psilichthys selwyni* Hall 1900, which has been assigned to various higher taxa since its original description, is re-examined. Several features previously unobserved are noted, such as the presence of cycloid scales and pelvic fins, and the fish is referred to the Sub-order Palaeoniscoidei; possibly belonging to the family Coccolepididae.

INTRODUCTION

Since Hall's original study in 1900, no further work on this fish has appeared in print, apart from classifications, and from the latter it is apparent that most authors have referred only to the original description and have not seen the material. During the course of a study of Victorian Mesozoic fish, *Psilichthys* was examined and it became evident that a redescription was necessary. Hall (1900) did not observe a number of important features, thereby misinterpreting the specimen.

SYSTEMATIC DESCRIPTION

Order Palaeonisciformes

Sub-order Palaeoniscoidei

Family ? Coccolepididae Berg 1940

Genus **Psilichthys** Hall 1900

Emended Diagnosis: A large fish; fusiform to slightly deepened body. Dorsal fin with axonosts and baseosts, anal with single row of axonosts. At least fourteen expanded haemal spines support tail. Twenty-seven dorsal fin axonosts; fourteen anal fin axonosts. Forty unbranched pelvic fin-rays; anal and caudal fin lepidotrichia unbranched. Fins long-based, pelvic without fulcra; strong fulcra on caudal fin dorsal lobe. Caudal, anal and pelvic fins close together. Scales cycloid, except on dorsal caudal lobe where they are lanceolate. Lanceolate scales probably enamelled.

Psilichthys selwyni Hall 1900

Diagnosis: As for genus; sole specimen.

Holotype: P12987, National Museum of Victoria.

Horizon: Lower Cretaceous; Korumburra Group (see Dettmann 1963 for age determination of Korumburra Group).

Locality: Hall (1900) stated: 'Carrapook (Muntham), county of Dundas, Western Victoria. From a tank sunk by Mr. Stock at his house, . . .' This tank has been relocated on the site of the old 'fattening paddock', close to the intersection of Wennicott Creek with the Glenelg Highway, on the north side of the highway at the 211 mile post. The site is on Block 8 of the McNichols Estate, bounded to the east by Featherstonhaugh Road and to the south by the Glenelg Highway.

Material: This comprises the posterior portion of the fish and consists of three main blocks. These bear: 1. Posterior axial skeleton, caudal and anal fins; 2. Axial skeleton with part of the dorsal fin and pelvic fin supports; 3. An isolated pelvic fin.

These blocks are embedded in plaster surrounded by a heavy wooden frame. As the rock-matrix is crumbling and at least partly attached to the plaster, no attempt has been made to remove the specimen, bearing in mind its unique nature.

Description

The axial skeleton consists of a series of neural and haemal arches fused to their respective spines (Pl. 17, 18, 19). There is no trace of any calcification in the sheath of the persistent notochord. The neural arches and spines lying beneath the anterior region of the dorsal fin are comparatively slender and curve toward the posterior in a shallow arc. They become progressively more robust posteriorly beneath the dorsal fin supports, with an obtuse angle on the anterior margin where arch and spine meet. Beyond the posterior margin of the dorsal fin supports, some of the neural spines and arches have rotated slightly on their long axes during preservation and the aperture of the arch is visible. These spines lie at a shallower angle to the notochord than do the more anterior elements, the last one or two having spatulate or 'oar-blade'

* National Museum of Natural Sciences, Ottawa, Canada.

distal regions. Beyond this point there is a sudden change in the character of the neurals, accentuated by the mode of preservation. The spatulate distal spine of the last neural noted appears to almost articulate with what seems to be the 'first neural' of the caudal region. It is slender and does not resemble the other caudal neurals. In fact this represents a dorsal displacement of the caudal neural spines and the last of the body neurals has been deflected dorso-laterally to reveal the neural arch. Posteriorly the neural arches (viewed laterally) are broad proximally and taper distally into the posteriorly-curving neural spines. The obtuse angle of their anterior margins measures about 150° and points posteriorly, unlike those beneath the dorsal fin, in which the angle points anteriorly.

The haemal arches and spines begin at about the level of the middle of the dorsal fin. Hall (1900) stated that they were '. . . similar to the neural, but the anterior ones are forked at their inner ends'. The 'fork' is the haemal arch, visible due to displacement of the bones. Five haemals are visible on the most anterior block of the specimen and another six may be counted before the first haemal supporting the caudal fin is reached. At least fourteen haemal spines support this fin, many of the anterior ones being very much thickened and expanded, with long, wide arches. They decrease rapidly in size posteriorly.

Unpaired Fins: The dorsal fin supports are clearly visible, there being two series, axonosts and baseosts. At least twenty-seven axonosts are present, becoming shorter posteriorly. They begin by being inclined antero-ventrally, are vertical by the level of the middle of the fin and then begin to be aligned postero-ventrally. The last seven are either vertical or tilted antero-ventrally. These were clearly figured by Hall (1900) and most are somewhat broadened proximally. Axonost fifteen (numbering from the anterior) is the broadest and is also forked proximally. The long, slender anterior axonosts show a narrow distal bifurcation, this dichotomy being broader in the middle of the series and reaching a maximum between axonosts sixteen to twenty. A fragment of a hollow but well-ossified bone shaft is preserved in the ninth element of the series. All other axonosts are represented by impressions.

The baseosts are poorly preserved, appear to reach a maximum size of about half the length of the axonosts and are inclined antero-ventrally. They are expanded or possibly bifurcate distally, but the proximal regions are obscured. There are at least forty-three jointed lepidotrichia, the proximal segment being longer than successive divisions. Although most of the distal portion of the dorsal fin has been destroyed, it is possible to state that it was long-based, being at least 100 mm in length.

The anal fin supports consist of a single row of at least fourteen axonosts, more originally having been present beyond the broken anterior margin of the fin. They are slim, hollow tubes of bone, slightly expanded proximally, and more so distally. At a cursory glance there appears to be part of a second row of endoskeletal elements present posteriorly, but this represents a series of primary proximal joints of the lepidotrichia, some displacement of the fin elements having occurred. These proximal fin-ray joints are triangular in isosceles fashion, with the apex of each pointing antero-dorsally. Some of the posterior segments still possess bone and are, therefore, more obvious than the others. At least forty-eight lepidotrichia are preserved, but undoubtedly more were present at the anterior edge of the fin. They are jointed and become more slender posteriorly. At the posterior margin of the fin a few small complete lepidotrichia are visible, showing a distal dichotomy.

The endoskeletal supports of the caudal fin have already been mentioned (see 'axial skeleton') and only the ventral fin-rays are preserved to any degree. It is difficult to count the lepidotrichia with any accuracy, particularly as they begin the first several bifurcations very close to their origins. There appear to be twenty-six in the ventral lobe, the first segment of each being several times as long as succeeding ones. Nothing is known of the lepidotrichia of the dorsal lobe, but to judge from the number and spacing of the bifurcations in the medial region of the fin, the whole fin was deeply cleft.

Paired Fins: A single isolated fin is present on the most anterior block of the specimen (Pl. 17, fig. 2). This fin was not mentioned by Hall (1900), but is set in the plaster well ahead of the other two blocks. Its dorsal surface bears four slender, curved, rod-like impressions which are expanded distally, the rest of the surface having been weathered away. The dorsal and vertical faces of the block bear another six which are followed posteriorly by fragments of several more. On Block 2, anterior to the level of the first haemal there are nine similar impressions and on the vertical face of this block there are six more of these curved rods, together with the proximal joints of a number of lepidotrichia. It is evident, therefore, that this paired structure of curved rods represents the supporting structure of paired fins, the pelvic fins. Although the edges of the one well-preserved pelvic fin are broken away, mainly at the posterior margin, little of the fin is missing, its original shape being that of an equilateral triangle. Forty articulated lepidotrichia are preserved and there may have been a few more originally. They are uniramous, robust, consist of comparatively small segments and lack fulcra.

Squamation: Hall described and illustrated five rows of lanceolate scale impressions on the upper caudal lobe, but only four such rows are present. Very thick fulcral scales overlie the dorsal margin of the dorsal caudal lobe. Hall mentioned '. . . a thin raised line of ferruginous material . . .' which cuts across the dorsal part of the caudal neural spines. He interpreted this as indicating a possible division of the spines into two series of elements. This impersistent 'raised line' represents the lower margin of a series of impressions of a further row of scales, laterally over-

lying the neural spines. Despite Hall's statement of the presence of fulcral scales in front of the dorsal fin, I cannot find any evidence of such scales in that position. Due to the broken anterior margin of the anal fin, nothing is known of similar scales in that area.

According to Hall the fish did not bear any scales on the body, hence the generic name. This is incorrect, as scales are preserved in several areas of the body. A row of scales runs for a distance along the lower edge of the notochordal sheath and parts of at least two more scale rows are visible overlying part of the dorsal fin supports. Another two scales may be seen covering the proximal segments of some fin-rays of the lower caudal lobe. These scales are cycloid, exhibit strongly marked circuli, but appear otherwise non-ornamented. Poorly preserved scale imprints may be determined in other regions of the trunk, but only with the use of low-angle illumination.

Remarks

A detailed examination of *Psilichthys* has shown that the preservation of its scales has depended upon the elevation and depression of the preserved surfaces. Almost all the body scales known are preserved in hollows or shallow depressions in the matrix, the raised regions being bereft of scales. The three fragmentary rows mentioned all occur in longitudinal hollows. The specimen shows very little bone, this probably having been stripped away by weathering and most elements are represented by impressions in the matrix. It is surely evident that one would not expect preservation of scales under such conditions, apart from odd exceptions, particularly if the scales were thin. The nakedness of the specimen is undoubtedly a vagary of preservation and no taxonomic significance should be attached to this or to the etymology of the name *psilichthys*.

The taxonomic assignment of *Psilichthys* has been a problem ever since Hall (1900) described it as possibly being related to *Chondrosteus*. Berg (1940) placed it within the Birgeriidae, while Romer (1945) classified it as belonging to the Chondrosteidae and in 1966 as pertaining to the Birgeriidae. Gardiner (1967) in his classification of the Chondrostei included *Psilichthys* within the Errolichthyidae. It is evident that all these classifications were influenced by the misleadingly naked appearance of the body of the fish.

The presence of cycloid scales, combined with the Lower Cretaceous age lead one to think in terms of the Coccolepididae, but if Berg's (1940) definition of the family is upheld, then *Psilichthys* is precluded by the presence of both axonosts and baseosts supporting the dorsal fin. Even though the Coceolepididae (Berg 1940) are supposed to have only one set of dorsal fin supports, Stensiö (1921) reported finding indications of baseosts in the dorsal fin of a specimen of *Coccolepis bucklandi* (the type species). The positions of the known fins of *Psilichthys* are closely similar to those of the coccolepid *Sunolepis yumenensis* (Liu 1957), although this arrangement is common to many palaeoniscoids (Gardiner 1967). Further resemblances to *Sunolepis* are indicated by the change in shape and size of the caudal neurals at the same point and by the cycloid, apparently non-tuberculate scales. It is possible, however, that the scale similarity may be due to convergence with *Psilichthys* representing the survival of a separate palaeoniscoid family into the Lower Cretaceous.

There is little to preclude *Psilichthys selwyni* from the Palaeoniseoidei and although its exact affinities must remain doubtful until more material is discovered, it appears to be closely related to known members of the Coceolepididae.

ACKNOWLEDGMENTS

I am indebted to Mr. T. A. Darragh, Curator of Fossils, National Museum of Victoria, for drawing my attention to this specimen, for allowing me to study it, and for helping to find the type locality. I wish to thank Professor J. W. Warren, Monash University, Department of Zoology, for helpful criticism of the manuscript and provision of facilities for study of the specimen. Mr. J. F. Gorman of Casterton, Mrs. E. E. Day of Coleraine and the *Casterton News* have all been of great help in the matter of relocating the provenance of *Psilichthys*. The work was undertaken during tenure of a Monash University Graduate Scholarship.

REFERENCES

Berg, L. S., 1940. Classification of fishes, both recent and fossil. *Trudy zool. Inst. Leningr.* 5, 2: 83-517.

Dettmann, M. E., 1963. Upper Mesozoic microfloras from south-eastern Australia. *Proc. R. Soc. Vict.* 77: 1-148.

Gardiner, B. G., 1967. Further notes on the palaeoniscoid fishes with a classification of the Chondrostei. *Bull. Br. Mus. nat. Hist. (Geol.)* 14, 5: 143-206.

Hall, T. S., 1900. A new genus and a new species of fish from the Mesozoic rocks of Victoria. *Proc. R. Soc. Vict.* 12: 147-151.

Liu, T. S., 1957. On a new Cretaceous palaeoniscoid fish from the Yumen of the Chichuan Basin, Western Kansu. *Vertebr. palasiat.* 1, 2: 103-122.

Romer, A. S., 1945. *Vertebrate Paleontology*. 2nd Edn. 687 pp. University of Chicago Press, Chicago and London.

————, 1966. *Vertebrate Paleontology*. 3rd Edn. 468 pp. *Ibid.*

Stensiö, E. A., 1921. *Triassic fishes from Spitzbergen. Part 1*. 307 pp. Vienna.

EXPLANATION OF PLATES 17-19

Plate 17

Fig. 1—*Psilichthys selwyni* Hall. Nat Mus. Vict. P12987. Posterior portion of body without the pelvic fin; × ½.

Fig. 2—*Psilichthys selwyni* Hall. Nat. Mus. Vict. P12987. Pelvic fin; × 1.

Plate 18

Psilichthys selwyni Hall. Nat. Mus. Vict. P12987. Central trunk region with anal and dorsal fin supports; × 1.

Plate 19

Psilichthys selwyni Hall. Nat. Mus. Vict. P12987. Caudal fin; × 1.